ELEMENTARY MATHEMATICS

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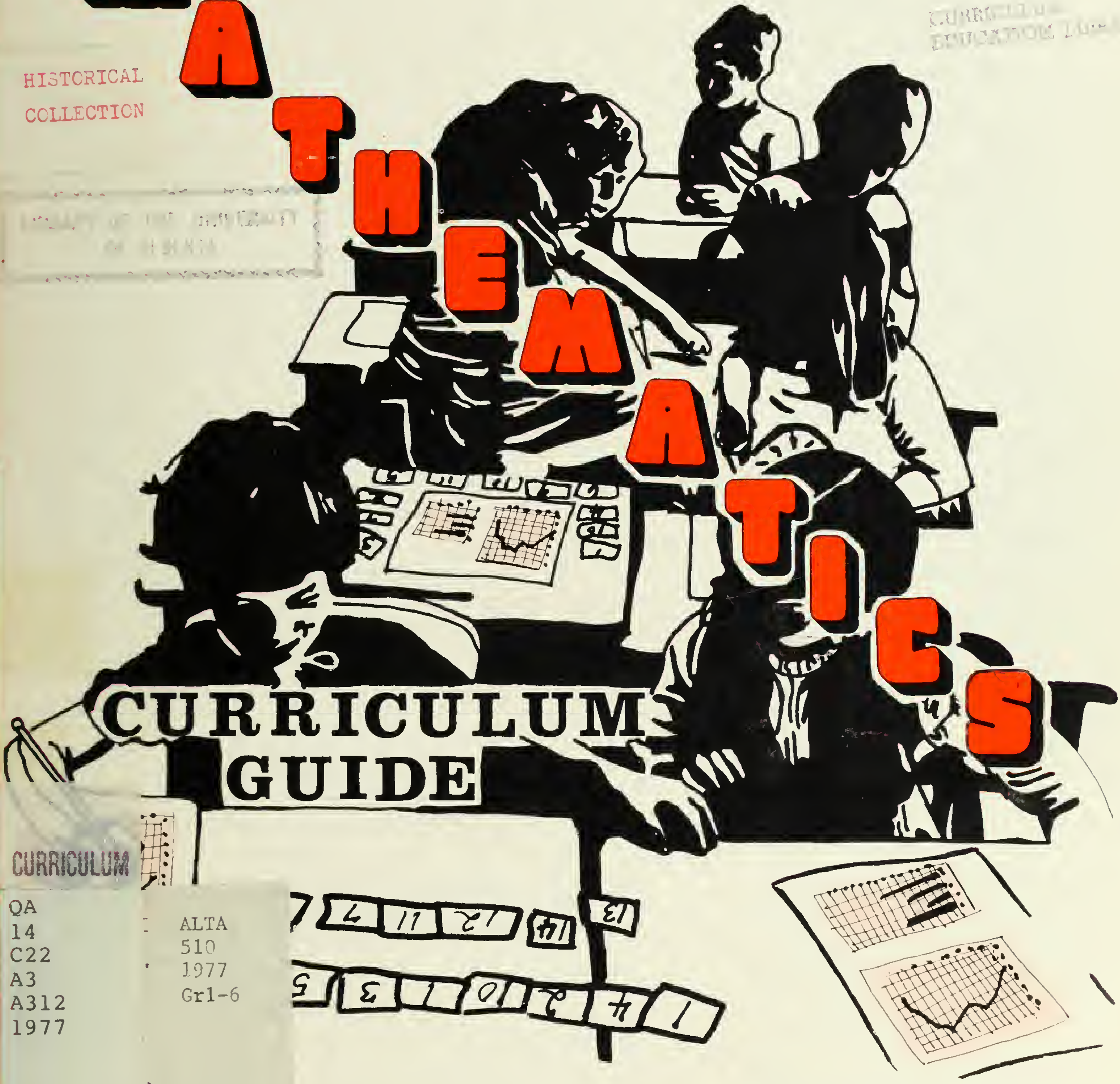

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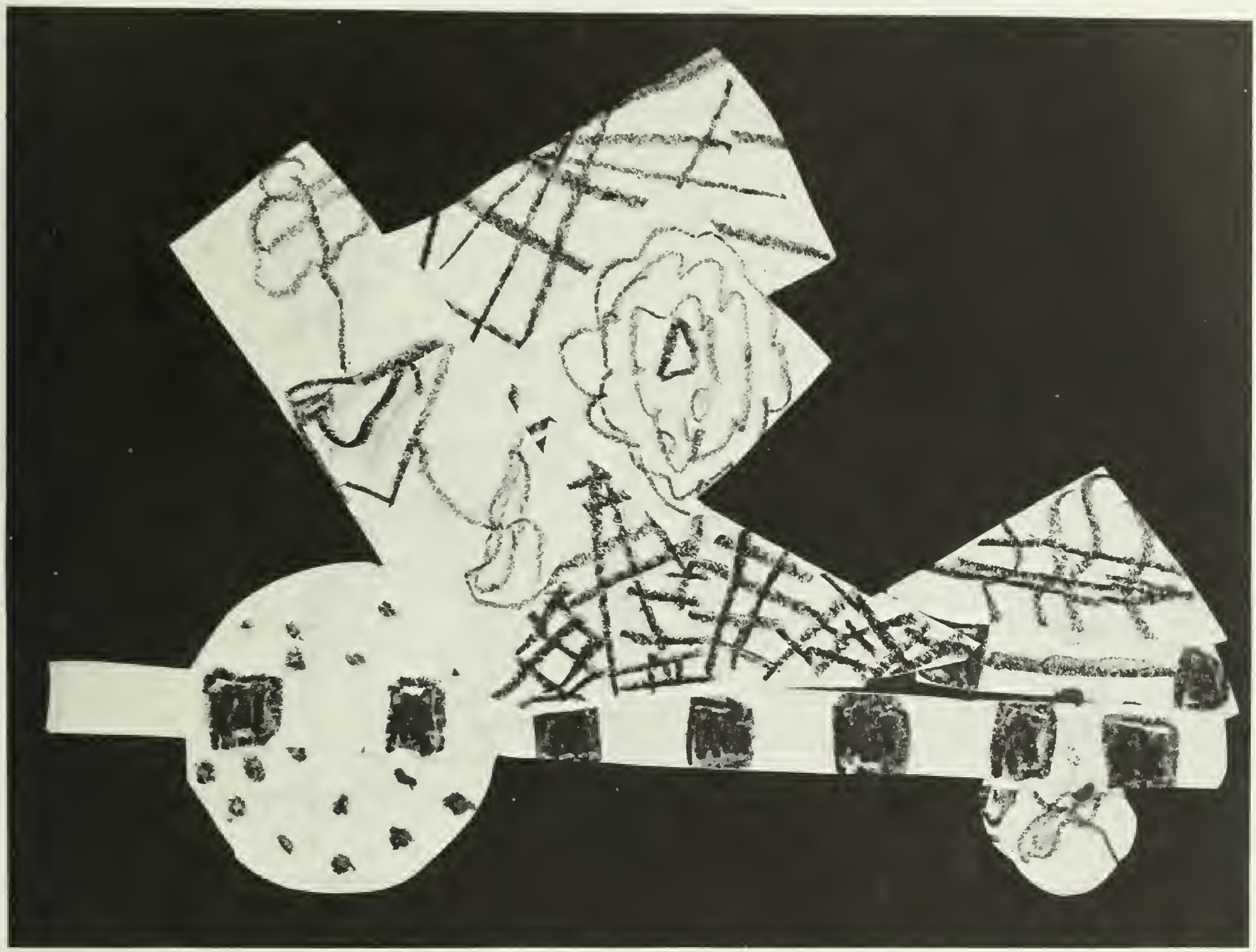

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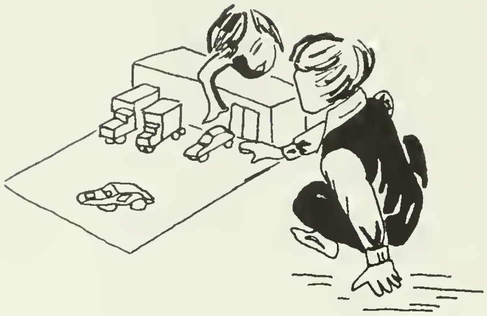
THE GOALS OF ELEMENTARY SCHOOL MATHEMATICS

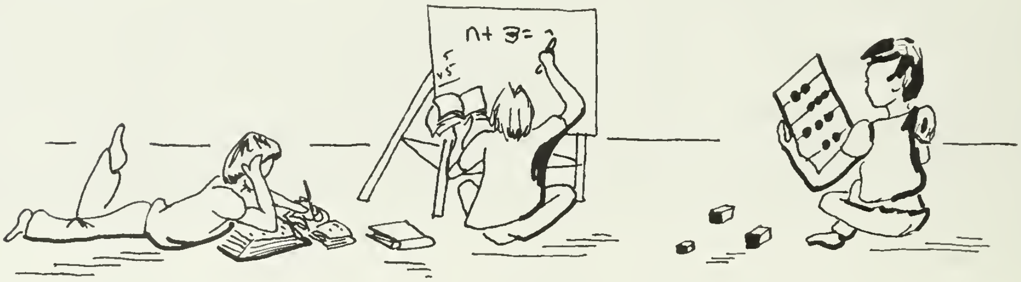
The goals of elementary school mathematics are to develop within the student the competency and willingness to deal with or interpret his environment:

How?



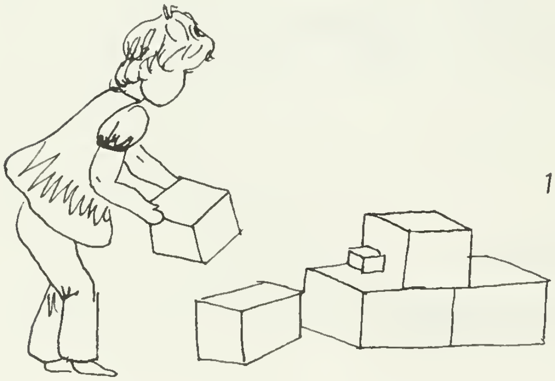
1. by giving the individual opportunity to discover order, pattern and relations which are the basis of mathematics found in the natural world.

2. by giving the individual proficiency in skills necessary for daily living.



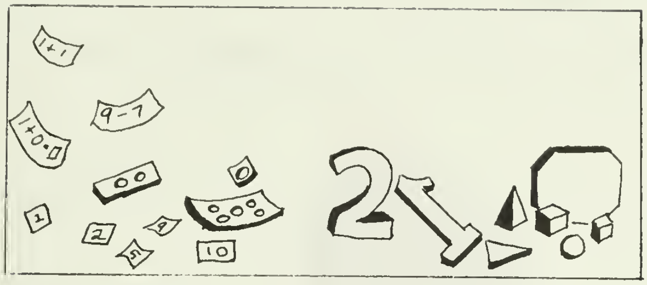
General Objectives

The general objectives of the elementary school mathematics program are of two related types.



1. those dealing with the learner and......

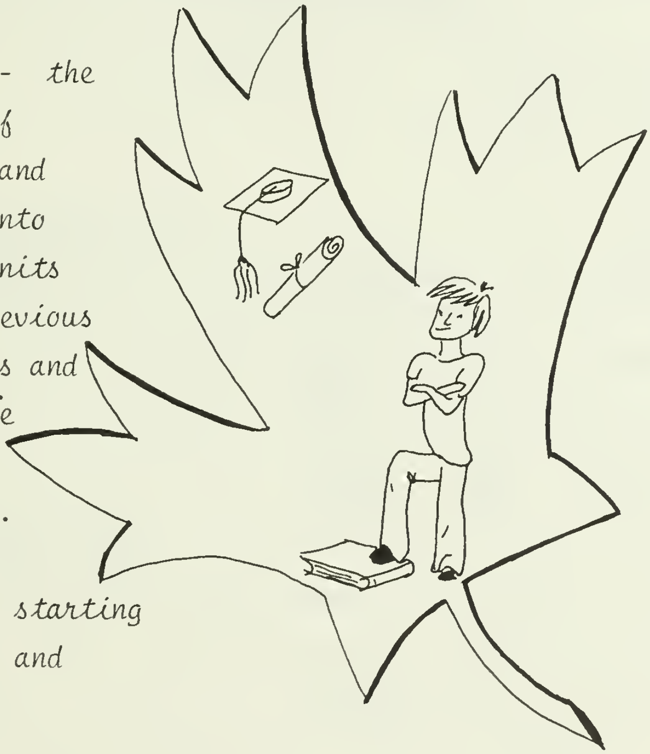
2. those dealing with mathematical content.



THE PROGRAM SHOULD foster within the learner:

1. a sense of accomplishment and success with mathematics which should lead to positive self concepts and,
2. a positive attitude towards mathematics.

THE PROGRAM SHOULD provide the capacity to cope with the environment through development of process skills:



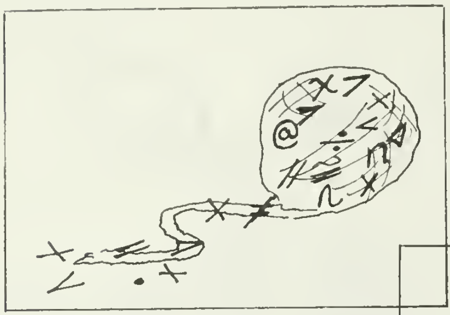
ORGANIZING - the collection of information and sorting it into meaningful units which fit previous organizations and allow for the addition of future units.

CREATING - starting with an idea and following it through to a product.

COMMUNICATING - the receiving of mathematical data and expressing results in such a way that others now understand.

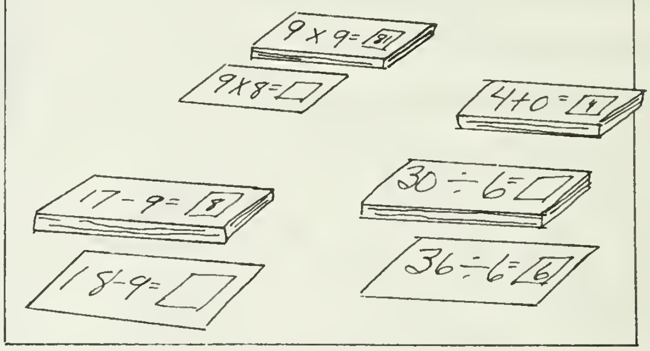
DECISION-MAKING - being able to define a problem, produce hypotheses about it and plan strategies to test these hypotheses.

THE PROGRAM SHOULD provide for the development of an understanding of numbers, operations and properties, measurement and graphing through:

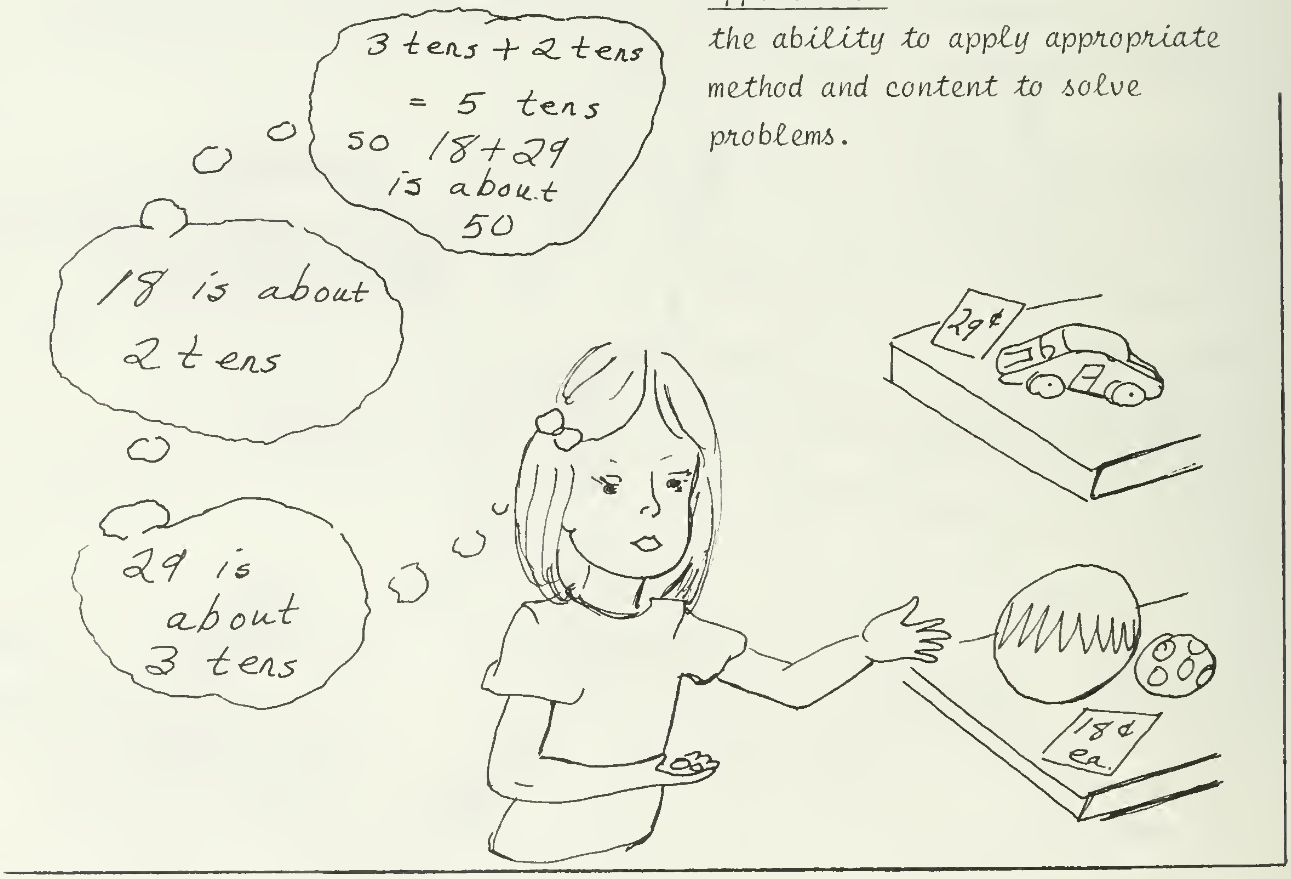


Mathematical literacy ..... receiving, understanding and using terms and symbols,

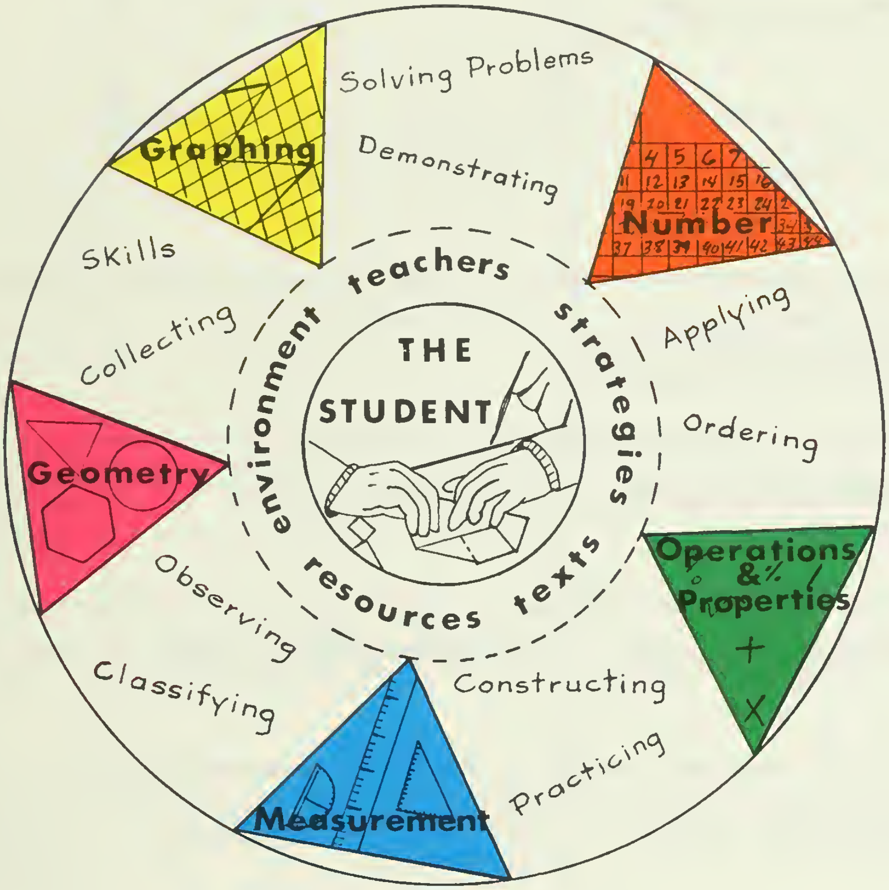
..... Arithmetic Skills recall of basic facts and the ability to compute,



Application ..... the ability to apply appropriate method and content to solve problems.



NOTES ON THE PROGRAM



A. Conceptual Design

The five divisions of the program are Number, Operations and Properties, Measurement, Geometry and Graphing. The curriculum is designed in spiral form where the basic concepts are introduced or extended at various levels. Topics within the five strands will often be developed concurrently. That is, basic concepts identified in number may be retaught and applied in the Operations and Properties, Measurement, or Graphing strands. The extent and method of development of each topic will remain the decision of the individual teacher, taking into consideration the abilities and background of each child. As a core program the objectives outlined are those which would normally be covered in a six-year period. However, flexibility with respect to applying program objectives to individuals is important.

NUM

Level A grade 1	Level B grade 2	Level C grade 3
Matches members of two sets and determines equivalent and non-equivalent sets.		
Associates a numeral with equivalent sets. (0-9) Cardinality.	Identifies the cardinal number associated with a set of objects.	
Demonstrates knowledge of the order property of numbers by ordering sets by relative size, by counting, and by arranging digits in order. (Ordinality)	Names ordinals first to tenth.	
Describes relationships such as more, fewer, greater than, less than, equal to. (no symbols)	Orders numerals and recognizes "betweenness." (0-100)	Orders and determines "betweenness" of whole numbers (0-1 000) and understand symbols >, < and = to show relationships.
Reads and writes numerals. (0-99)	Reads and writes numerals. (0-999)	Reads and writes numerals. (0 - 9 999)
Identifies and renames the number of 10's and the number of 1's in any 2 digit number.	Identifies the number of 100's, 10's and 1's in a given three-digit numeral.	Identifies the number of 1 000's, 100's, 10's, 1's and tenths. Rewrites numbers in expanded notation (0 - 1 000) and vice versa.
	Identifies multiples by counting by 5's, 10's and 100's.	Identifies multiples by counting by 2's, 5's, 10's, 25's, 100's (0 - 1 000)
	Identifies and represents fractions (halves and quarters) in a concrete setting.	Identifies, writes and compares fractions from physical representation (halves, quarters, tenths, and fifths).
		Reads and writes decimals to tenths.

BER

evel D grade 4	Level E grade 5	Level F grade 6
		Identifies and orders integers.
Identifies and uses place value of digits (0.01 - 99 000).	Identifies and uses place value of digits (0.001 - 999 999).	Identifies place value to billions (0.0001 - 1 000 000 000)
Regroups 5-digit whole numbers and rewrites in expanded notation. Rounds whole numbers (limit: 3-digit accuracy).	Rounds whole numbers. (limit: 5-digit accuracy).	
dentifies, reads and writes a fraction represent a point on a number line a region with emphasis on halves, arters, fifths and tenths. dentifies equivalence. Generates uivalent fractions for halves, quarters, ifths, tenths and hundredths.	Expresses tenths, hundredths, and thousandths as fractions or decimals. Solves for the missing numeral in proportional ratios without using cross-products.	Expresses halves, quarters and fifths as fractions or decimals. Uses decimal fractions to express and solve for percent.
Interprets simple ratio situations. Expresses and generates proportional ratios.	Expresses and generates proportional ratios.	Identifies applications of proportional ratios.
Reads and writes decimals to hundredths.	Rounds to tenths and hundredths.	Writes decimal numerals using expanded notation. Rounds numerals to required accuracy including thousandths.
Regroups tenths and hundredths.		

OPERATIONS A

Level A grade 1	Level B grade 2	Level C grade 3
Understands the process of addition and subtraction. Symbolizes addition and subtraction situations.	Symbolizes addition and subtraction situations in both the horizontal and vertical form.	Adds and subtracts two or three digit numbers with and without regrouping.
		Understands the unique effect of 0 and 1 in addition and multiplication respectively.
		Identifies additive, subractive, multiplicative and divisive situations. Symbolizes multiplication and division situations.
	Understands the basis of the commutative property for addition.	Understands the basis of the commutative property of addition and multiplication.
	Understands the processes of multiplication and division.	
Demonstrates mastery of the basic facts involving sums and minuends through 9.	Demonstrates mastery of basic facts involving sums and minuends to 18.	Demonstrates mastery of basic facts involving sums, minuends, products and dividends to 18.
		Identifies related sentences for addition, subtraction, multiplication and division.
	Solves picture and word problems. Estimates answers.	Solves word problems. Estimates Answers.
		Multiplies whole numbers by 10 and 100.
	Adds and subtracts to 99 with no regrouping.	

ND PROPERTIES

Level D grade 4	Level E grade 5	Level F grade 6
Adds and subracts numbers using standard or expanded notations.	Adds and subtracts whole numbers.	Adds and subtracts whole numbers.
Understands the basis of associative property of addition and multiplication.		
Multiplies whole numbers by one and two digit whole numbers.	Multiplies whole numbers using one, two, and three digit multipliers.	Multiplies using one, two and three digit multipliers. Checks multiplication by division and division by multiplication.
Demonstrates mastery of basic facts for sums and minuends to 18 and products and dividends through 81.	Demonstrates mastery of basic facts.	Demonstrates mastery of basic facts.
Divides one and two-digit whole numbers by a one-digit divisor (with and without remainders).	Divides whole numbers using one and two digit divisors (with and without remainders).	Divides using one, two and three digit divisors (with or without remainders).
Writes related sentences for addition, subtraction, multiplication and division.		
Solves word problems. Estimates answers.	Solves word problems. Estimates answers.	Solves word problems. Estimates answers.
Mentally multiplies whole numbers by 10, 100, and 1 000. Estimates products and quotients.	Estimates products and quotients.	Mentally computes simple addition, subtraction, multiplication and division problems.
Adds and subtracts decimals to hundredths.	Adds, subtracts and multiplies decimals to thousandths.	Multiplies and divides decimals.

MEASU

Level A grade 1	Level B grade 2	Level C grade 3
Tells the time to hour.	Tells the time to hour, half hour, and quarter hour. Writes the hour, half hour and quarter hour using standard notation.	Tells and writes the time to the nearest hour, half hour, quarter hour and five minute intervals. Uses noon, midnight, a.m. and p.m
Recites the days of the week in order.	Reads the dates on the calendar. Recites months of the year in order.	Knows the months of the year in order.
	Reads the Celsius thermometer to ten degree intervals.	Reads Celsius thermometer to one degree intervals.
		Expresses linear measurement to the nearest tenth.
Compares two or more objects as shorter than, longer than, thinner than, thicker than, heavier than, lighter than, etc. Estimates and measures unsing non-standard units of capacity, mass and linear measures.	Estimates and uses standard units of length, capacity, and mass, m, cm, ℓ, kg .	Extends estimation and measurement to include the use of the standard units km, dm .
Identifies instruments for measuring time, mass, length, capacity and temperature.	Identifies proper measuring instruments for a given task.	Uses standard instruments, (metre stick, litre container, mass scales, calendar, Celsius thermometer).
Recognizes pennies, nickles, dimes and quarters, and the value of each.	Counts collections of coins up to 25¢. Gives equivalent value of coins to 25¢. Makes purchases up to 25¢.	Counts collections of coins up to $1.00. Makes purchases and change up to $1.00.

REMENT

Level D grade 4	Level E grade 5	Level F grade 6
Reads and writes time to minutes.	Reads and writes time to seconds. Reads the 24 hour clock.	Reads the 24 hour clock and writes corresponding time notation.
	Extends use of standard units to include tonnes.	
Reads Celsius thermometer (familiarity with freezing and boiling points of water, body and environmental temperatures).		
Expresses linear measure to nearest hundredth.	Understands the system of metric prefixes, including use of symbols. kilo hecto deca Basic Unit deci centi milli	
Extends estimation and measurement to include the use of the standard units, m, mℓ, and g .	Uses appropriate standardized measuring units.	
Uses appropriate standardized measuring units.		
Uses money (coins and bills) for purchasing and making change.	Draws 2-D figures to scale using grid paper.	
	Expresses equivalent measures within units of length, mass and capacity. e.g. 1 m + 4 dm + 2 cm = 1.42 m, 14.2 dm, or 142 cm	Reads distances according to a scale. Draws diagrams according to a scale.
Expresses equivalent measures within units of capacity, mass, length and time. (e.g. 1 dm = 10 cm).	Finds perimeter of polygons without using formulae. Finds area of regular polygons without using formulae.	Knows interrelationships among units of length, capacity, and mass.
Finds perimeters of regular polygons without using formulae. Finds area of rectangles without using formulae.	Finds volume of rectangular solids without using formulae.	Finds perimeter of polygons with and without formulae. Finds area of triangles and quadrilaterals using formulae.
		Finds volume of rectangular solids using formulae.

GEOM

Level A grade 1	Level B grade 2	Level C grade 3
Classifies, by manipulation, 3-dimensional objects according to various attributes.	Classifies 3-dimensional objects in relation to corners, edges, and faces.	
Recognizes and names: circle, square, triangle, rectangle.		
	Classifies 2-dimensional figures in relation to boundaries, corners and faces.	Classifies and identifies 2-dimensiona figures and 3-dimensional objects.
	Develops geometrical patterns using 3-dimensional objects and 2-dimensional figures.	Constructs 2-dimensional figures using straws, pipecleaners, wires, geoboard, etc.
		Constructs 3-dimensional objects with Plasticine or modeling clay.
		Recognizes corresponding parts in polygons.

GRAP

Collects data from immediate environment and constructs graphs using pictures or objects.	Constructs simple bar and pictographs using data collected from immediate environment.	Collects data and constructs simple bar, line and pictographs.
	Locates position of an object on a 10 x 10 grid.	Locates position of an object on a grid.
		Identifies the axes. Plots points on a grid when given the two co-ordinates.

ETRY

Level D grade 4	Level E grade 5	Level F grade 6
	Identifies radius, diameter and circumference.	
		Constructs 3-dimensional objects.
Recognizes congruency of polygons.	Names corresponding sides and angles of congruent polygons. Distinguishes 2-dimensional figures as similar or congruent.	
Identifies axis of symmetry in symmetric objects and figures. Identifies translations (slides), reflections (flips), and rotations (turns).	Tests congruency of polygons using motion geometry (slides, flips and turns).	Translates, rotates, reflects, and enlarges 2-dimensional figures.
		Identifies and names lines, line segments, rays, intersecting lines, parallel lines, perpendicular lines.

HING

Constructs line, bar and pictographs.	Constructs line, bar and pictographs.	
Recognizes and reads bar, line, circle and pictographs.	Interprets and solves problems using data collected from line, bar and pictographs.	
Writes co-ordinates as ordered pairs.	Reads and writes co-ordinates from a graph.	
Generates ordered pairs from a given relationship.	Generates ordered pairs from a given relationship. Graphs ordered pairs from given relationships.	Generates ordered pairs from a given relationship involving integers.
		Locates points in all four quadrants.

B. Core

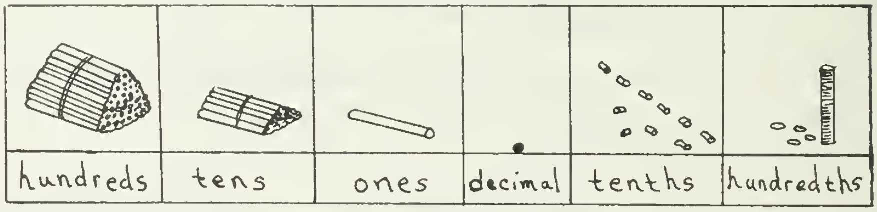
The program represents a core of mathematics concepts and skills objectives listed sequentially at each grade level. This basic core of mathematics is designed to enhance success opportunities for the majority of students.

C. Pre-number Development

Prior to planning any instruction, one must choose content and strategies that are based on the learning characteristics of children.

The young student as a learner depends upon sensory information of a concrete form. Mathematical concepts are, by nature, abstract. For this reason it is necessary that children develop a background of sensory experiences to which they can relate mathematical abstractions. For example, we cannot expect that children can experience adding numbers in the same way that they can experience fire or heated objects. Yet they can manipulate a set of objects and gradually, through much experience, form in their minds a mathematical idea.

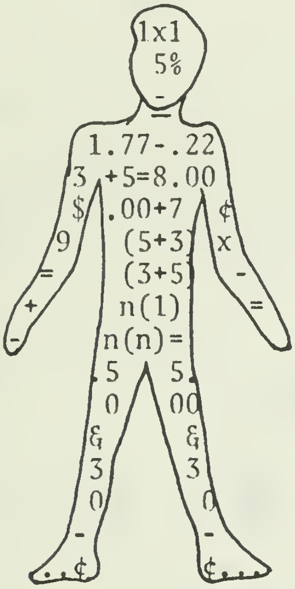
Pre-number activities involving the classifying, sorting, comparing and ordering of shapes and objects must be planned as the basis of this link between the realm of sensory touch and mathematical understanding.



D. Number

This strand provides for the study of number concepts and relationships. In keeping with the change to metric and the success orientation of the program, two basic changes are: the study of fractional numbers is limited to those easily converted to decimal notation (halves, quarters, fifths, tenths and hundredths); decimal notation receives greater emphasis and is introduced at an earlier stage.

E. Operations and Properties



Operations and properties are the basis of all mathematical computations. The acquisition of these skills has hopefully been enhanced by; allowing more time for mastery of basic facts; emphasizing thorough facility with basic computational procedure; and eliminating the operations with common fractions. To coincide with the change to metric measurement, operations with decimals have been emphasized.

F. Measurement

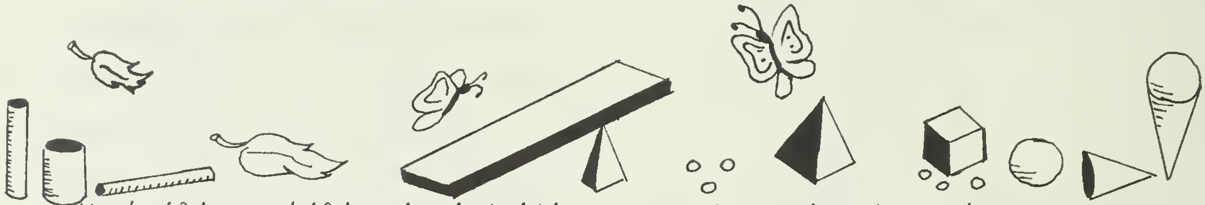
By 1978 - 80 the normal everyday transactions in the Canadian economy should be in metric units. In view of this, Alberta Education recognizes that young children will be in an essentially metric world by the time they have completed their elementary education. School conversion should now be well under way.

Initially, upper elementary students might miss key metric ideas developed in earlier grades. Therefore, teachers should be prepared to adjust their program accordingly.

The scope and sequence of this strand is SI Metric. The metric system is best handled in a real life, hands on approach. Estimation should be considered as an important part of measurement.

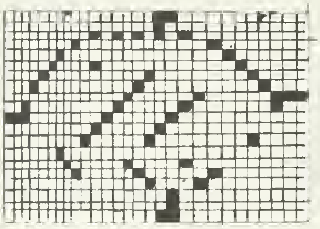
G. Geometry

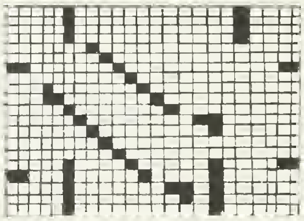
Numbers are used to describe aspects of our world whether it be our bank account, the building in which we work or some other aspect. To describe our world requires us to recognize sizes, shapes and relationships. Geometry is the organized study that teaches us to recognize these attributes, whether it be similarity involved in ratio and proportion, in similar triangles or in leaves on trees; or the symmetry of the multiplication table, of the square, of the butterfly; or some other attribute.

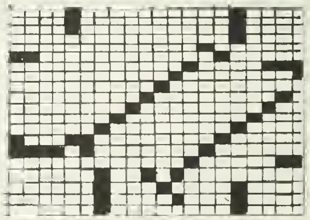


We build on children's intuitive concepts moving from the concrete to the formal consistent with the child's mental development. We do this by first studying solids (3-D) through moving, sorting, classifying, constructing, and describing; then by studying plane shapes (2-D) through a parallel scheme of moving, sorting, classifying, constructing, and describing.

In elementary grades, the abstraction of numbers is linked to our real world - the concrete - through application, measurement and geometry. By upper elementary we use coordinates to describe the location of a shape - be it on a grid, a map or in a parking lot. Finally, the elementary program relates numbers and shapes through perimeter, area and volume.

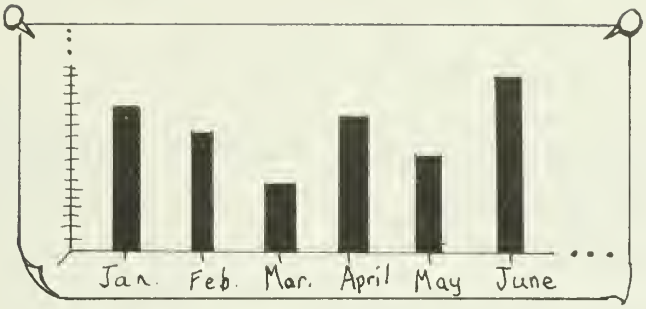






Geometry is a unifying theme of mathematics and only with appropriate knowledge of both geometry and number concepts has the individual reached his mathematical potential.

H. Graphing

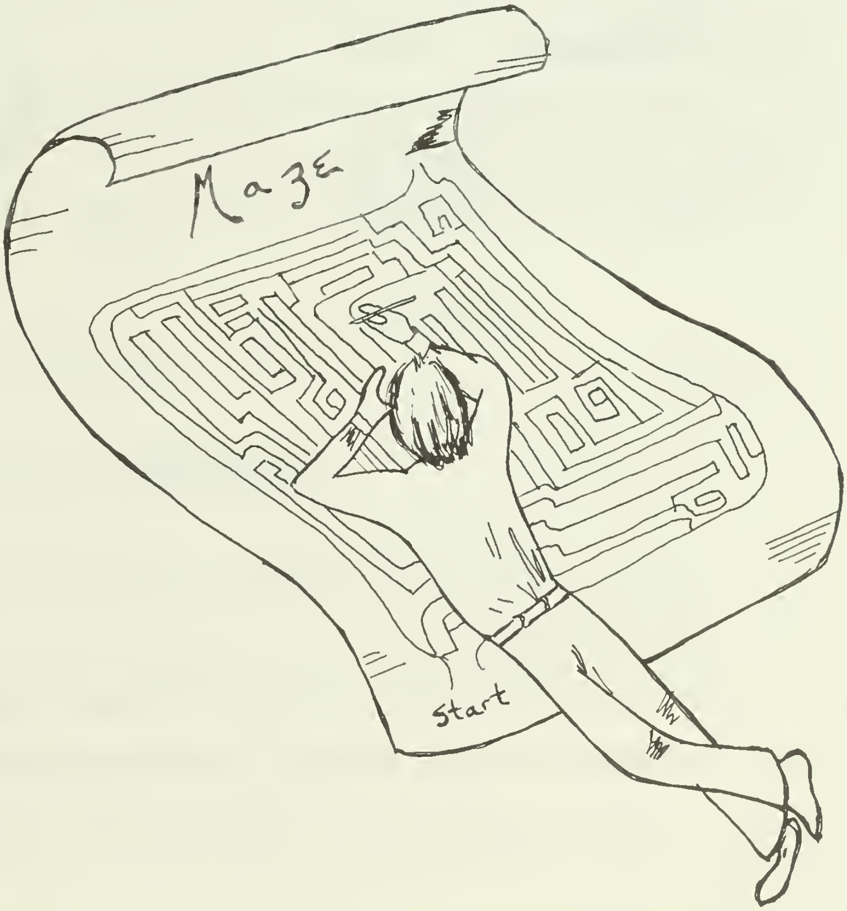


Graphing has been included as a separate strand and yet it can and should be applied to each of the number, operations and properties, measurement and geometry strands. In addition, stated program objectives involving the communicating, organizing, and creating of mathematical ideas can be achieved within this aspect of the program.

I. Problem Solving

There is no strand in the program entitled "Problem Solving". This is because we want to think of problem solving, not as a topic unto itself, but rather as a unifying process which permeates all the strands of the program. Problem solving should be included in a stufy of numeration, operations, measurement, geometry, graphing, number theory and all other topics.

A true problem, as opposed to an exercise, is any situation where a desired solution is not immediately obvious, or the method for solving the situation is not immediately apparent.



Problem solving then becomes a process of conscious deliberation in which the individual endeavors to

1. understand the problem
2. devise a plan for attacking the problem
3. carry out the devised plan
4. check to see if the solution is correct or reasonable.

In addition to direct computation, effective strategies for solving problems, should include writing equations, estimating, listing information in an organized way, making tables of data, graphing, searching for a pattern and using models (including diagrams) to represent the problem. Children should be encouraged to generate and solve their own mathematical problems.

J. Vocabulary

The program design de-emphasizes many of the terms associated with number and geometric properties specifically. Understanding of the principle is more fundamental than memorizing the term.

algorithm

Identify

distributive

open and closed curves

Associative

tesselations

Commutativity

K. The Textbook

All of the prescribed references (texts) contain more material than is required to meet the core program objectives. The program outline rather than the texts) determines the course content.

L. The Teacher

Teachers will find it necessary to adjust instructional material and to select suitable activities for their classes. This includes the selection of appropriate remedial and enrichment materials, activities projects, etc.

PRESCRIBED REFERENCES

1. DeVault, M.V., et al, Mathematics Learning System Text, Toronto: Science Research Associates, 1974
2. Eicholz, R.E., et al, Investigating School Mathematics, Don Mills: Addison Wesley, 1973
3. Elliott, H.A., Project Mathematics, Toronto: Holt, Rinehart and Winston, 1974

EVALUATION

Evaluation is a goal oriented process reflecting not only how well pupils learn, but how well the subject is taught. Evaluation should direct itself at least to the objectives as outlined in the program of studies.

Methods of evaluation should include:

i. Observing the pupil at work

ii. Interviewing the pupil

iii. Analyzing daily assignments

iv. Administering survey, diagnostic, attitude, textual and teacher-made tests.

Evaluation has a diagnostic aspect that involves the analysis of data, and observation to determine the exact nature of the successes and difficulties encountered by pupils, and thereby provides the basis for changes in the instructional program. Diagnosis should consider the type of errors made rather than the number of errors. Several of the methods of evaluating will be used for assessing achievement of students for comparative or reporting purposes.

STUDENT PROFILE RECORD

The following student profile section is included so that teachers can keep a record of the progress of students throughout their elementary grades. Blank spaces under the listed objectives are for additional objectives. At the beginning of the school term teachers can duplicate a copy of their grade level chart for each student and maintain a record of individual student progress throughout the year. This information can then be placed in cumulative records for receiving teachers.

LEVEL A (Grade 1)

	NOTES AND COMMENTS
NUMBER	
1. Matches members of two sets and determines equivalent and non-equivalent sets.	
2. Describes relationships such as more, fewer, greater than, less than, equal to. (no symbols)	
3. Associates a numeral with equivalent sets. (0-9) Cardinality.	
4. Demonstrates knowledge of the order property of numbers by ordering sets by relative size, by counting, and by arranging digits in order. (Ordinality)	
5. Reads and writes numerals. (0-99)	
6. Identifies and renames the number of 10's and the number of 1's in any 2 digit number.	
OPERATIONS AND PROPERTIES	
1. Understands the process of addition and subtraction.	
2. Symbolizes addition and subtraction situations.	
3. Demonstrates mastery of the basic facts involving sums and minuends through 9.	
MEASUREMENT	
1. Tells the time to hour.	
2. Recites the days of the week in order.	

3. Compares two or more objects as shorter than, longer than, thinner than, thicker than, heavier than, lighter than, etc.	
4. Estimates and measures using non-standard units of capacity, mass and linear measures.	
5. Identifies instruments for measuring time, mass, length, capacity and temperature.	
6. Recognizes pennies, nickles, dimes and quarters, and the value of each.	
GEOMETRY	
1. Classifies, by manipulation, 3-dimensional objects according to various attributes.	
2. Recognizes and names: circle, square, triangle, rectangle.	
GRAPHING	
1. Collects data from immediate environment and constructs graphs using pictures or objects.	

LEVEL B (Grade 2)

	NOTES AND COMMENTS
NUMBER 1. Identifies the cardinal number associated with a set of objects.	
2. Orders numerals and recognizes "betweenness." (0-100)	
3. Reads and writes numerals. (0-999)	
4. Names ordinals first to tenth.	
5. Identifies the number of 100's, 10's and 1's in a given three-digit numeral.	
6. Identifies multiples by counting by 5's, 10's and 100's.	
7. Identifies and represents fractions (halves and quarters) in a concrete setting.	
OPERATIONS AND PROPERTIES	
1. Symbolizes addition and subtraction situations in both the horizontal and vertical form.	
2. Understands the basis of the commutative property for addition.	
3. Understands the processes of multiplication and division.	
4. Demonstrates mastery of basic facts involving sums and minuends to 18.	
5. Solves picture and word problems. Estimates answers.	
6. Adds and subtracts to 99 with no regrouping.	

MEASUREMENT	
1. Tells the time to hour, half hour, and quarter hour.	
2. Writes the hour, half hour and quarter hour using standard notation.	
3. Reads the dates on the calendar.	
4. Recites months of the year in order.	
5. Estimates and uses standard units of length, capacity, and mass, m, cm, ℓ, kg .	
6. Identifies proper measuring instruments for a given task.	
7. Reads the Celsius thermometer to ten degree intervals.	
8. Counts collections of coins up to 25¢.	
9. Gives equivalent value of coins to 25¢.	
10. Makes purchases up to 25¢.	
GEOMETRY	
1. Classifies 3-dimensional objects in relation to corners, edges, and faces.	
2. Classifies 2-dimensional figures in relation to boundaries, corners and faces.	
3. Develops geometrical patterns using 3-dimensional objects and 2-dimensional figures.	

GRAPHING	
1. Constructs simple bar and pictographs using data collected from immediate environment.	
2. Locates position of an object on a 10 x 10 grid.	

LEVEL C (Grade 3)

	NOTES AND COMMENTS
NUMBER	
1. Orders and determines "betweenness" of whole numbers (0-1 000) and understands symbols >, < and = to show relationships.	
2. Identifies multiples by counting by 2's, 5's, 10's, 25's, 100's (0-1 000).	
3. Reads and writes numerals. (0-9 999).	
4. Identifies the number of 1 000's, 100's, 10's, 1's and tenths.	
5. Rewrites numbers in expanded notation (0-1 000) and vice versa.	
6. Reads and writes decimals to tenths.	
7. Identifies, writes and compares fractions from physical representation (halves, quarters, tenths, and fifths).	
OPERATIONS AND PROPERTIES	
1. Identifies additive, subtractive, multiplicative and divisive situations.	
2. Adds and subtracts two or three digit numbers with and without regrouping.	
3. Symbolizes multiplication and division situations.	
4. Identifies related sentences for addition, subtraction, multiplication and division.	
5. Understands the basis of the commutative property of addition and multiplication.	
6. Understands the unique effect of 0 and 1 in addition and multiplication respectively.	
7. Demonstrates mastery of basic facts involving sums, minuends, products and dividends to 18.	

8. Multiplies whole numbers by 10 and 100.	
9. Solves word problems. Estimates answers.	
MEASUREMENT	
1. Tells and writes the time to the nearest hour, half hour, quarter hour and five minute intervals.	
2. Knows the months of the year in order.	
3. Uses noon, midnight, a.m. and p.m.	
4. Counts collections of coins up to $1.00.	
5. Makes purchases and change up to $1.00.	
6. Read Celsius thermometer to one degree intervals.	
7. Extends estimation and measurement to include the use of the standard units km, dm .	
8. Uses standard instruments, (metre stick, litre container, mass scales, calendar, Celsius thermometer).	
9. Expresses linear measurement to the nearest tenth.	
GEOMETRY	
1. Classifies and identifies 2-dimensional figures and 3-dimensional objects.	
2. Constructs 2-dimensional figures using straws, pipecleaners, wires, geoboard, etc.	
3. Constructs 3-dimensional objects with Plasticine or modeling clay.	
4. Recognizes corresponding parts in polygons.	

GRAPHING	
1. Identifies the axes.	
2. Collects data and constructs simple bar, line and pictographs.	
3. Locates position of an object on a grid.	
4. Plots points on a grid when given the two co-ordinates.	

LEVEL D (Grade 4)

	NOTES AND COMMENTS
NUMBER	
1. Identifies and uses place value of digits (0.01 - 99 000).	
2. Regroups 5-digit whole numbers and rewrites in expanded notation.	
3. Rounds whole numbers (limit: 3-digit accuracy).	
4. Identifies, reads and writes a fraction to represent a point on a number line or a region with emphasis on halves, quarters, fifths and tenths.	
5. Identifies equivalence. Generates equivalent fractions for halves, quarters, fifths, tenths and hundredths.	
6. Interprets simple ratio situations.	
7. Reads and writes decimals to hundredths.	
8. Regroups tenths and hundredths.	
9. Expresses and generates proportional ratios.	
OPERATIONS AND PROPERTIES	
1. Adds and subtracts numbers using standard or expanded notation.	
2. Writes related sentences for addition, subtraction, multiplication and division.	
3. Estimates products and quotients.	
4. Multiplies whole numbers by one and two digit whole numbers.	

5.	Divides one and two-digit whole numbers by a one-digit divisor (with and without remainders).	
6.	Demonstrates mastery of basic facts for sums and minuends to 18 and products and dividends through 81.	
7.	Solves word problems. Estimates answers.	
8.	Mentally multiplies whole numbers by 10, 100, and 1 000.	
9.	Adds and subtracts decimals to hundredths.	
10.	Understands the basis of associative property of addition and multiplication.	
MEASUREMENT		
1.	Extends estimation and measurement to include the use of the standard units, mm, ml, and g .	
2.	Reads and writes time to minutes.	
3.	Expresses equivalent measures within units of capacity, mass, length and time. (e.g. 1 dm = 10 cm).	
4.	Finds perimeters of regular polygons without using formulae.	
5.	Reads Celsius thermometer (familiarity with freezing and boiling points of water, body and environmental temperatures).	
6.	Finds area of rectangles without using formulae.	
7.	Uses appropriate standardized measuring units.	
8.	Uses money (coins and bills) for purchasing and making change.	
9.	Expresses linear measure to nearest hundredth.	

GEOMETRY	
1. Recognizes congruency of polygons.	
2. Identifies axis of symmetry in symmetric objects and figures.	
3. Identifies translations (slides), reflections (flips), and rotations (turns).	
GRAPHING	
1. Recognizes and reads bar, line, circle and pictographs.	
2. Constructs line, bar and pictographs.	
3. Writes co-ordinates as ordered pairs.	
4. Generates ordered pairs from a given relationship.	

LEVEL E (Grade 5)

	NOTES AND COMMENTS
NUMBER	
1. Expresses tenths, hundredths, and thousandths as fractions or decimals.	
2. Rounds whole numbers. (limit: 5-digit accuracy).	
3. Identifies and uses place value of digits. (0.001 - 999 999).	
4. Expresses and generates proportional ratios.	
5. Solves for the missing numeral in proportional ratios without using cross-products.	
6. Rounds to tenths and hundredths.	
OPERATIONS AND PROPERTIES	
1. Adds and subtracts whole numbers.	
2. Multiplies whole numbers using one, two, and three digit multipliers.	
3. Divides whole numbers using one and two digit divisors (with and without remainders).	
4. Estimates products and quotients.	
5. Demonstrates mastery of basic facts.	
6. Solves word problems. Estimates answers.	
7. Adds, subtracts and multiplies decimals to thousandths.	

MEASUREMENT		
1.	Extends use of standard units to include tonnes.	
2.	Reads and writes time to seconds.	
3.	Reads the 24 hour clock.	
4.	Draws 2-D figures to scale using grid paper.	
5.	Finds area of regular polygons without using formulae.	
6.	Finds volume of rectangular solids without using formulae.	
7.	Uses appropriate standardized measuring units.	
8.	Understands the system of metric prefixes, including use of symbols. kilo hecto deca Basic Unit deci centi milli	
9.	Expresses equivalent measures within units of length, mass and capacity. e.g. 1 m + 4 dm + 2 cm = 1.42 m, 14.2 dm, or 142 cm	
10.	Finds perimeter of polygons without using formulae.	
GEOMETRY		
1.	Tests congruency of polygons using motion geometry (slides, flips and turns).	

2. Names corresponding sides and angles of congruent polygons.	
3. Distinguishes 2-dimensional figures as similar or congruent.	
4. Identifies radius, diameter and circumference.	
GRAPHING	
1. Interprets and solves problems using data collected from line, bar and pictographs.	
2. Constructs line, bar and pictographs.	
3. Reads and writes co-ordinates from a graph.	
4. Generates ordered pairs from a given relationship.	
5. Graphs ordered pairs from given relationships.	

LEVEL F (Grade 6)

	NOTES AND COMMENTS
NUMBER	
1. Expresses halves, quarters and fifths as fractions or decimals.	
2. Rounds numerals to required accuracy including thousandths.	
3. Writes decimal numerals using expanded notation.	
4. Identifies place value to billions (0.0001 - 1 000 000 000)	
5. Identifies and orders integers.	
6. Identifies applications of proportional ratios.	
7. Uses decimal fractions to express and solve for percent.	
OPERATIONS AND PROPERTIES	
1. Adds and subtracts whole numbers.	
2. Multiplies using one, two, and three digit multipliers.	
3. Divides using one, two and three digit divisors (with or without remainders).	
4. Checks multiplication by division and division by multiplication.	
5. Mentally computes simple addition, subtraction, multiplication and division problems.	
6. Multiplies and divides decimals.	
7. Demonstrates mastery of basic facts.	
8. Solves word problems. Estimates answers.	

MEASUREMENT	
1. Finds perimeter of polygons with and without formulae.	
2. Finds area of triangles and quadrilaterals using formulae.	
3. Finds volume of rectangular solids using formulae.	
4. Reads distances according to a scale.	
5. Draws diagrams according to a scale.	
6. Knows interrelationships among units of length, capacity, and mass.	
7. Reads the 24 hour clock and writes corresponding time notation.	
GEOMETRY	
1. Identifies and names lines, line segments, rays, intersecting lines, parallel lines, perpendicular lines.	
2. Translates, rotates, reflects, and enlarges 2-dimensional figures.	
3. Constructs 3-dimensional objects.	
GRAPHING	
1. Locates points in all four quadrants.	
2. Generates ordered pairs from a given relationship involving integers.)	

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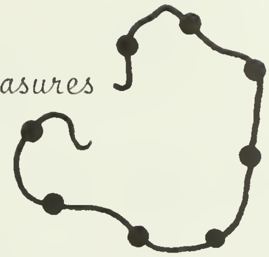
COMPREHENSIVE LIST OF MATH LAB EQUIPMENT

(A)

Abacus, assorted
Activity Cards; manufactured, self-made
Adding Machine
Adhesives
Analysis of metric measures
Area boards, assorted
Ascoblocs
Ascobrics
Aviator's watch

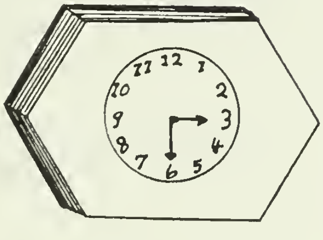


(B)

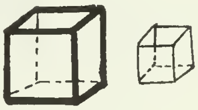
Balance-lever
Balance scales
Balls, assorted
Barometer
Beads, assorted - size, shape,
colour, material
Bead-wires/laces
Bead-frames
Bills, currency (various)
Binoculars
Blocks, assorted - table, floor, building,
interlocking, wooden, rubber, plastic
Blueprints
Bottles, plastic
Bottle-caps, metal
Boxes, assorted sizes - transparent
and opaque
Buckets, plastic, assorted sizes

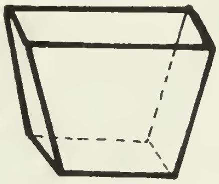
(C)

Calculators, simple
Calendars, assorted types
Callipers
Cans- soup, juice, etc.
Candles
Card-holder
Cards, playing/standard
Card Games, assorted
Cartons, plastic
Cash-register
Catalogues
Cellograph and Symbols
Chart-stand
Charts
Clay, modelling
Clinometer
Clocks, demonstration model
constructional, asst'd
defunct clocks, clock-stamps,
alarm, electric, etc.



Coherograph & symbols
Coins, standard, ancient
Color-Math. Apparatus
Colander
Collections - assorted objects
assorted materials
Compass, land
Compasses, pairs - demonstration
pairs - individual
Constructional Apparatus
Cooking-timer
Co-ordination Boards
Corks
Counters, assorted
Counting-frames
Crayons, assorted
Cribbage Board
Cubes, coloured, approx. 1 cm, and
3 cm cubes
Cuisenaire Rods - demonstration set
individual sets
Cylinders, sets, assorted

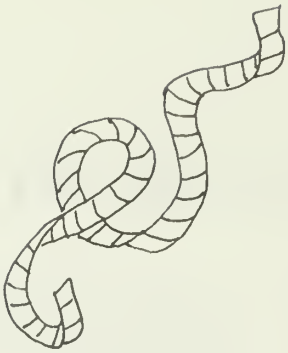




(D)

Date stamp
Dart Board
Decimal place-holder
Decimal Boards
Dice, assorted - table & floor size
Dienes Math. Apparatus
Dienes Blocks
Dominoes, pictorial, standard
table and floor size

(E)

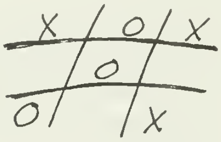


Easel, presentation
Egg cartons
Egg timer
Elastic bands, assorted
Empric counter **balance**

Equalizer
Environmental materials
Environment - local statistics,
economics, maps,
studies, reports, etc.
Experience Chart Pads

(F)

Fabrics, assorted
Felt, assorted
Felt Pens - thick/thin, assorted colors
Files - folder type
Files - loose-leaf
Filing Cabinet

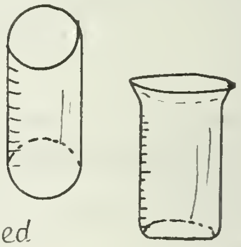


Films, 8mm, 16mm
Filmstrips
Fraction Boards, assorted
Fraction Wheels, assorted
Forms - ordering
Funnels, assorted sizes, plastic/metal

(G)

Games: Bingo, Chess, Draughts, Hex,
Ludo, Mah Jong, Monopoly,
Oscillator, Quoits, Skittles,
Snakes & Ladders, Spillikins,
Tic-Tac-Toe, etc.
Geo-boards
Geo-magnetic symbols

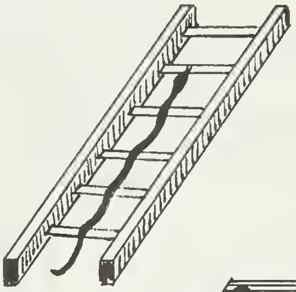
Geo-plans
Geometric figures, assorted (2D)
Geometric solids, assorted (3D)
Globes
Gradient finder
Graph Board, chalk
Graph Chart, cloth
Graph Paper, assorted



(H)

Hachette Precalculation Materials
Height measure, wall
Hourglass

Hundred Boards, assorted
Hygrometer
Hypsometer



(I)

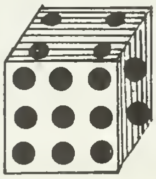
Indian Beads
Indian Ink

Inflatables, dice, shapes, dolls
Istrex calculating materials

(J)

Jars, assorted

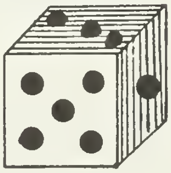
Jelly moulds, assorted
Jigsaw puzzles, assorted



(K)

Kaleidoscopes
Kinder-city

Kites, assorted, constructional
Knitting patterns
Knitting materials & tools



(L)

Labels, assorted
Land compass
Land chain
Land: rights, titles, etc.
Lego Sets
Light Meters
Liquid Measures, standard
Liquid Measures, metric

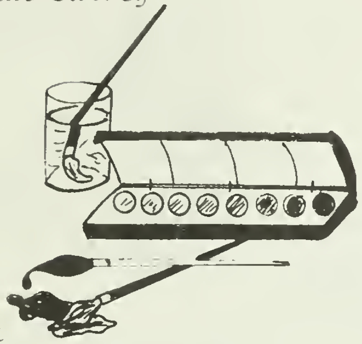
Living Index, cost of
Locks, combination, etc.
Locomotion models: cars, engines,
aeroplanes, etc. games
Logarithm tables
Log Books (Observation Recording)
Logic Blocks
Lotto, game

(M)

III IV V VI VII

Magna Board
Magnetic symbols
Magnetic tape
Magnets, assorted
Magazines, assorted
Magazine rack
Magnifying Glass
Maps, assorted - Local Survey
Map measurer
Mapping pens
Map rail
Marbles, assorted
Mariner's compass

Measuring cups, assorted
Measuring spoons, assorted
Metric measures
Metronome
Micrometer
Miniatures: trucks, cars, dolls, animals, planes, etc.
Mirrors, unbreakable, magnifying
Model-making materials: balsa wood, marquetry kits, etc.
Montessori Apparatus
Mosaics, assorted, floor & table
Musical instruments
Muffin tins



(N)

Nails, assorted
Nail Board, circular
Nail Board, square
Nail Frames
Nail Puzzles

Number lines, various
Number poles
Numerals: pictorial, jig-saw, peg, wooden templates
Numeral-number: sorting, matching

(P)

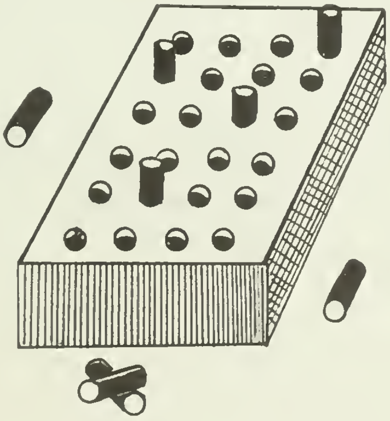
Paint, assorted
Paint Brushes, assorted
Paint Rollers & Trays, assorted
Paper: Carbon, Cartridge, Construction, Corrugated, Duplicating, Freize-roll, Graph, Manilla tag, Metallic Railboard, Stencils, Sugar, Tracing, Tissue, etc.
Paper bags
Paper patterns
Paper plates
Pattern Boards, assorted
Pedometer
Pegboards, 25, 100
Pegs, assorted
Peg-games, (e.g.Merripegs)
Pencils, assorted, B to 4H
Pendulum
Pens, assorted
Perimeter Boards

Periscopes
Personal scales
Picture files
Pins
Place-value Boards
Plasticene
Plastic-sheeting
Plastic tubing
Play-Store: cartons, boxes, cans, packets, etc.
Plumb line
Polaroid Camera & Film
Poleidoblocs. Set G
Poleidoblocs. Set A
Popsicle sticks
Posters
Projectors, screens
Protractors, demonstration individual
Pulleys, wheels, weights
Pyramids, stacking, cuboid

(R)

Rain Gauge
Ready-reckoners
Reference Charts
Reference Library
Roman Numerals

Ropes, assorted
Roulette wheel
Roulette chips
Rubber stamps, assorted
Rulers, assorted

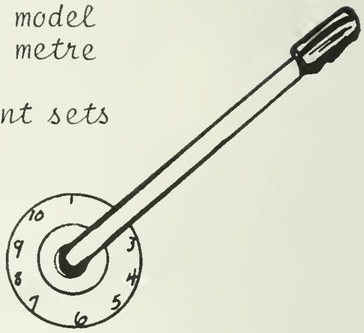


(S)

Sand, and container
Scales and weights
Scissors, left & right handed
Set Squares - 30°, 60°
Set Squares - 45°
Shapes, assorted
Sieve
Slides
Slide rules, simple
Sorting trays
Spirit level
Spirograph Kit
Spools, assorted
Spring balance
Stacking apparatus, assorted
Stern Structural Apparatus
Stethoscope
Stopwatch
Straight-Edge
Straws
Survey tape, steel
Surveyor's Sighting Pole
Sundial

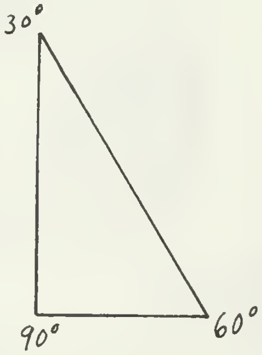
(T)

Table, demonstration
Table covers, assorted
Tape Recorder, Tapes, Headsets
Tapemeasures, various
Tangrams, assorted
Templates, assorted
Ten-Square Boards
Telephone: field, battery, toy
Telephone Directories
Theodolite, simple
Thermometers: Centigrade, **Fahrenheit**
  Maximum & Minimum
  Wet-Dry Bulb
  Clinical, Cooking
  Earth Thermometer
  Immersion, etc.
Thread, various
Thumbtacks
Tickets, numbered
Tiles, loose, assorted, floor, wall, ceiling
Timetables: airline, bus, train
Tinker Toy Kit
Toothpicks
Train and track, model
Trundlewheels, 1 metre
T-Square
Typewriter - print sets



(U)

Umbrella frame
Unifix cubes
Unifix Math. Apparatus
Used, postage stamps
Utensils, domestic



(V)

Ventimeter
Vocabulary Reference
Volume Relations Sets

(W)

Water Wagon
Weather Vane
Weaving Cards, loom
Weights, sets, standard
Weights, sets, metric
Wheels, various, cogwheels, et.
Wool, assorted
Wrist Watch

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